RECIRCULATING GRAVEL FILTER

Description. A bed of coarse sand in a container which filters and biologically treats septic tank effluent. The filter effluent is returned to the recirculation tank for blending with untreated septic tank effluent and recirculated back to the filter. The treated effluent is distributed to a disposal trench of reduced dimension. System components include: septic tank, recirculating tank with float valve and low pressure distribution system, free access filters, and a drainfield.

Conditions for Approval.

1. Non-domestic wastewater with BOD or TSS exceeding normal domestic wastewater strengths (Page 20-1) is required to be pretreated to these levels prior to discharge into the recirculating sand filter system.
2. The bottom of the filter must not come within twelve inches of seasonal high groundwater.

System Design.

1. The recirculation ratio is 4:1. Pumps are set by timer to dose approximately 5 to 10 minutes per 30 minutes. Longer dosing cycles may be desirable for larger installations, e.g., 20 minutes every 2 to 3 hours. Hydraulic loading is 5 gal/ft²/day (forward flow).

2. The filter media is very fine washed gravel (pea gravel), with 100% passing the 3/8 inch sieve, an effective size of 3 to 5 mm, a uniformity coefficient <2, and < 1% passing a # 50 sieve.

3. The minimum recirculating chamber size is one-half the volume of the septic tank.

4. Sand filter container, piping, gravel, and gravel cover should meet the minimum requirements as shown herein. No soil cover is required.

5. The filter container shall be constructed of reinforced concrete or other materials where equivalent function, workmanship, watertightness and at least a twenty-year service life can be documented. The following requirements must be met for flexible membrane liners:
   a. Have properties equivalent to or greater than thirty mil polyvinyl chloride.
   b. Have field repair instructions and materials provided to the purchaser of the liner.
   c. Have factory fabricated "boots" for waterproof field bonding of piping to the liner.
   d. Liner must be placed against smooth, regular surfaces free of sharp edges, nails, wire, splinters, or other objects that may puncture the liner. A four-inch layer of clean sand should provide liner protection.

6. Float valves or equivalent bypass alternatives are required in the recirculation tank. Discharge to the drainfield must occur after filtration.

7. The media and pipe shall be covered to prevent accidental contact and to provide access to the filter surface for filter maintenance.

8. Extreme climates may require insulation of the recirculating sand filter lid or cover to prevent freezing of the media.

RECIRCULATING GRAVEL FILTER (Cont'd)

Filter Construction.

1. All materials must be structurally sound, durable and capable of withstanding normal installation and operation stresses. Components that may be subject to excessive wear must be readily accessible for repair or replacement.

2. All filter containers must be placed over a stable level base.

3. The pressure system must be designed and installed according to the guidance given for Pressure Distribution Systems. Geotextile filter fabric shall not be used in the recirculating sand filter.

4. Access to the filter surface must be provided to facilitate maintenance.

Gravity Disposal Trenches.

1. Except as noted herein the final disposal trenches must meet the requirements of a standard trench system.
2. The following distances must be maintained between the trench bottom and the limiting layer:

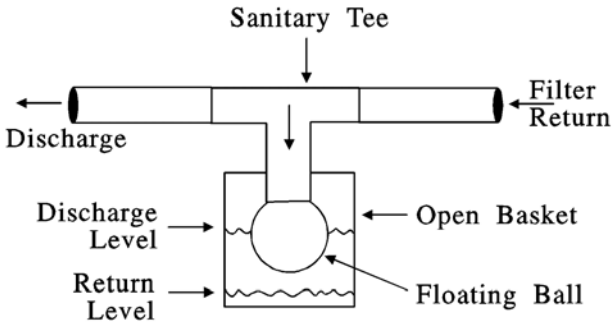
Limiting Layer	Flow <2,500 GPD	Flow ≥2,500 GPD
	All Soil Types	All Soil Types
Impermeable Layer	2	4
Fractured Rock or Very Porous Layer	1	2
Normal High Ground Water	1	2
Seasonal High Ground Water	1	2

3. Capping fill may be used to obtain adequate separation from limiting layers.
4. The minimum area, in square feet of bottom trench surface, shall be calculated from the maximum daily flow of effluent divided by the figure below:

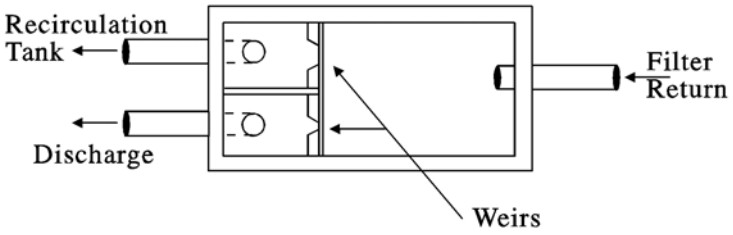
Soil Group	Gallons/ft²/Day
A-1	1.7
A-2	1.2
B-1	0.8
B-2	0.6
C-1	0.4
C-2	0.3

RECIRCULATING GRAVEL FILTER (Cont'd)
FIGURES

By-Pass Alternatives

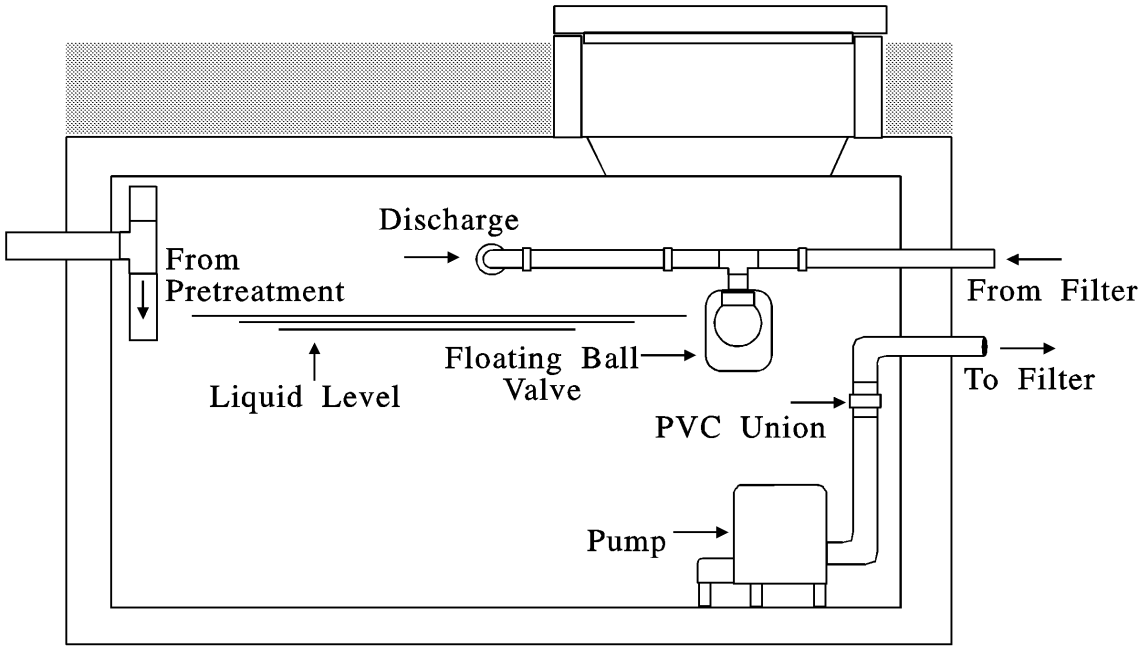


Floating Ball Valve

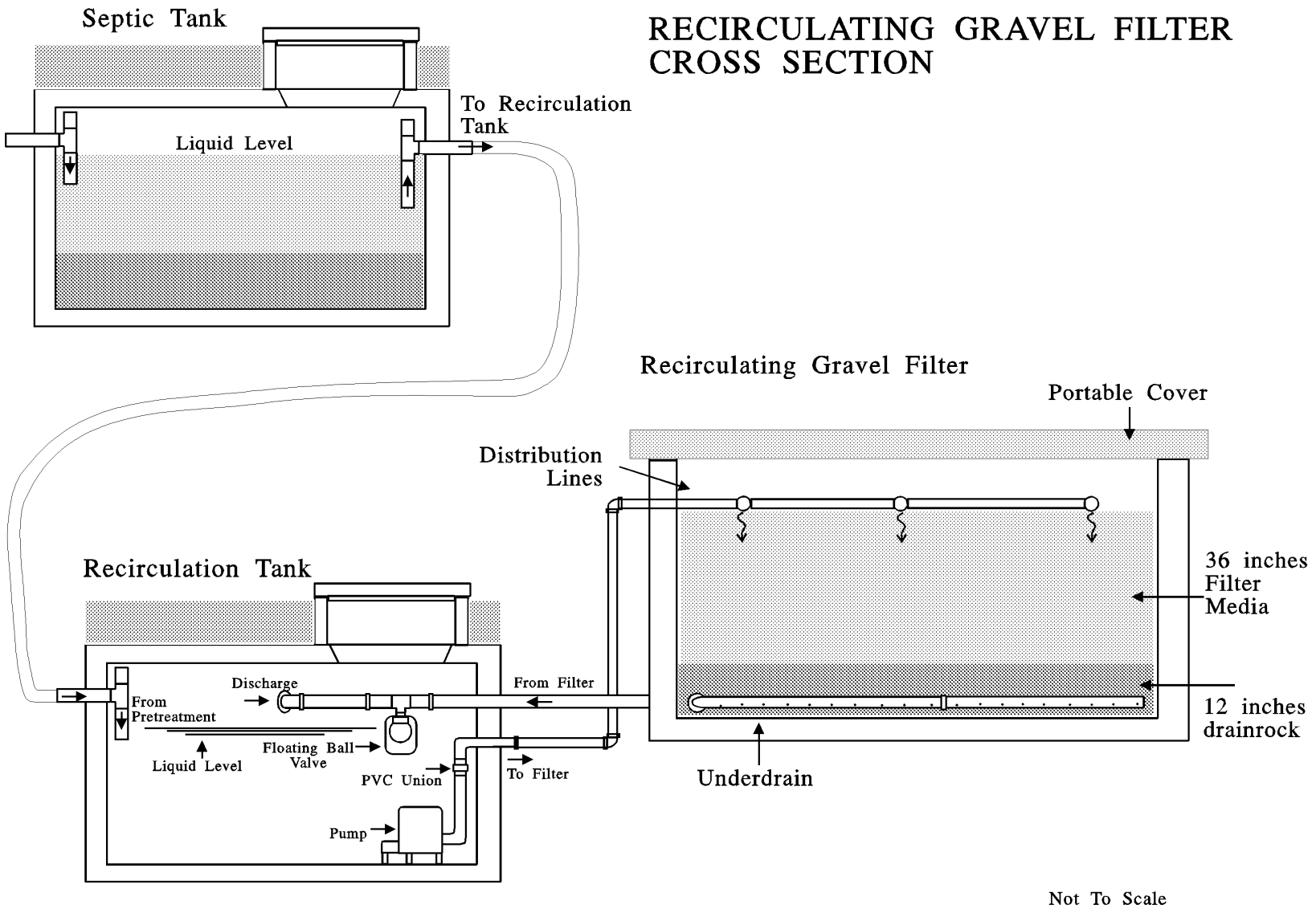


Adjustable Weirs

Recirculation Tank



RECIRCULATING GRAVEL FILTER (Cont'd)


RECIRCULATING GRAVEL FILTER
CROSS SECTION
Septic Tank
To Recirculation Tank
Liquid Level
Recirculating Gravel Filter
Portable Cover
Distribution Lines
36 inches Filter Media
12 inches drainrock
Underdrain
Recirculation Tank
Discharge
From Pretreatment
From Filter
Floating Ball Valve
Liquid Level
PVC Union
To Filter
Pump
Not To Scale